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## MEMORANDUM

DATE: 12 January 1999

TO: David Bennett, WAM, U.S. EPA, Region X

FROM: Michelle Turner, Chemist, WESTON, Seattle  
~~RENN~~ Roger McGinnis, Senior Environmental Chemist, WESTON, Seattle

SUBJECT: Validation of Inorganics Data  
Laboratory Batch: K9805755  
Site Duwamish River

WORK ASSIGNMENT NO : 46-23-0JZZ

WORK ORDER NO.: 4000-019-038-5200-00

DOC. CONTROL NO 4000-019-038-AAAK

cc: Bruce Woods, RAP-WAM, U.S. EPA, Region X  
Dena Hughes, Site Manager, WESTON, Seattle (memo only)  
Kevin Mundell-Jackson, Database Management, WESTON, Seattle

The quality assurance review of twenty sediment samples, laboratory batch K9805755, collected from the Duwamish River has been completed. The sediment samples were analyzed for inorganics by Columbia Analytical Services of Kelso, Washington using EPA Methods 200, 6010, 6020, and 7000 series as required to achieve detection limit goals. The samples were numbered:

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QA Review Batch K9805755 (Inorganics/Metals)

Site Duwamish River

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98354000	98354001	98354002	98354003	98354004
98354005	98354006	98354007	98354008	98354009
98354010	98354011	98354012	98354013	98354014
98354015	98354016	98354017	98354018	98354019

Data Qualifications

The following comments refer to the laboratory performance in meeting the quality control criteria described in the technical specifications of the laboratory subcontract. The review follows the format described in the U.S. EPA *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA OSWER 9240 1-05-01, February 1994) modified to include specific requirements of the analytical methods

1. Holding Times

Holding times of 28 days for mercury and six months (from date of collection to analysis) were established in the project Sampling and Analysis Plan. All samples met holding time criteria

2 Calibration

a) Initial Calibration

Initial calibration frequencies and QC criteria were met for ICP and ICP/MS analyses.

Mass calibration for all ICP/MS internal standards was within 0.1 atomic mass unit of the true mass. ICP/MS resolution was less than 0.9 amu full width at 10 percent peak height

b) CRI/CRA Standards

Instrument calibration was verified using low level standards near the project required detection limit.

c) Initial and Continuing Calibration Verification

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## QA Review Batch K9805755 (Inorganics/Metals)

Site: Duwamish River

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All inductively coupled plasma (ICP) and ICP/MS results met control limits of 90 to 110 percent recovery (percent R) of the true values for both initial and continuing calibration.

Mercury cold vapor AA (CVAA) results met control limits of 80 to 120 percent recovery (percent R) for both initial and continuing calibration.

### 3 Instrument Detection Limits

All instrument detection limits (IDL) for ICP, ICP/MS, and mercury analyses met project requirements specified in the project Sampling and Analysis Plan.

### 4. Blanks

#### a) Laboratory Method Blanks

The following analytes were detected in laboratory method blanks.

Blank ID	Analyte	Concentration	Associated Samples
K9805755-MB	Calcium	4 mg/Kg	98354000 through 98354019
K9805755-MB	Lead	0.03 mg/Kg	98354000 through 98354019
K9805755-MB	Tin	0.7 mg/Kg	98354000 through 98354019

Results for analytes listed above were qualified as undetected (UJ) if concentrations in associated samples were less than five times the concentration present in the blank.

#### b) Initial Calibration and Continuing Calibration Blanks

The following elements were found in calibration blanks.

Blank ID	Analyte	Concentration	Associated Samples
CCB1	Chromium	3 µg/L	none

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As no samples were directly associated with the calibration blank, no qualifiers were assigned based on calibration blank results

c) Field Blanks

No field blank samples were associated with this laboratory batch

5. ICP and ICP/MS Interference Check

All analytes for the interference check samples were within the control limits of 80 to 120 percent of the true values. Internal standard intensities for analytes determined by ICP/MS were within  $\pm$  20 percent of the initial calibration intensity

6. Laboratory Control Sample

Laboratory control sample recoveries were within the control limits (P-project, L-laboratory) for all analytes except the following:

Analyte	% Recovery	QC Limit
Antimony	78	80-120 (P) 24-176 (L)

The recovery for Antimony was below the lower project QC limit, indicating potential low bias. Results for the above elements were qualified as estimated (UJ/J).

7. Laboratory Duplicate Sample Analysis

All relative percent differences (RPD) between analytical results were within the QC limit of 35 percent (or  $\pm$  2 times the quantitation limit for concentrations < 5 times the quantitation limit).

8. Spiked Sample Analysis

The matrix spike recoveries for the following analytes were outside QC limits.



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Site: Duwamish River

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Sample	Analyte	Percent Recovery	QC Limits
98354000	Antimony	26	75-125

In addition, as the native sample concentrations for Aluminum and Iron exceeded the spike concentration by more than 4 times, recoveries were not calculated. Data were not qualified solely on matrix spike results.

9. ICP and ICP/MS Serial Dilution

Serial dilutions were not routinely performed for this SDG.

10. ICP/MS Quality Control

a) Duplicate Analysis

Duplicate analyses were not performed for this SDG.

b) Post Digest Spike Recovery

Post digest spikes were not performed for this SDG.

c) Method of Standard Additions

No samples required MSA analysis.

d) ICP/MS Internal Standards

The intensity of all internal standards was within limits of 30 to 120 percent of the initial calibration intensity for all samples

10. Field Duplicate Analysis

Samples 98354000 and 98354001 were field duplicates. The relative percent difference between duplicate results was within limits of 35 percent RPD.

Samples 98354007 and 98354008 were also field duplicates. The relative percent difference between duplicate results was within limits of 35 percent RPD.



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#### 11. Sample Analysis

A cursory raw data review was performed. All laboratory deliverables were present and complete. The case narrative notes that the MS recovery of Antimony for sample 98354000 was outside the QC limits due to suspected matrix interference. The LCS recovery was within the QC limits, so no further action was taken. The MS recoveries for Aluminum and Iron were not calculated due to high analyte concentrations in the sample. No other problems were noted.

#### 12 Laboratory Contact

No laboratory contact was required.

#### Data Assessment

Upon consideration of the data qualifications noted above, the data are ACCEPTABLE for use except where flagged with data qualifiers that modify the usefulness of the individual values

#### Data Qualifiers

U - The material was analyzed for, but was not detected.

UJ - The analyte was not detected. The associated quantitation limit is an estimate because quality control criteria were not met.

J - The analyte was positively identified, but the associated numerical value is an estimated quantity because quality control criteria were not met or because concentrations reported were less than the CRDL or lowest calibration standard.

R - Quality control indicates that data are unusable (compound may or may not be present). Resampling and reanalysis are necessary for verification.

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354000	Units	mg/Kg (ppm)
Lab Code	K9805755-001	Basis	Dry
Test Notes			

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	18400	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	US
Arsenic	EPA 3050B	200 8	0.5	0.1	10	9/8/98	9/29/98	16.3	
Barium	EPA 3050B	6010B	1	0.6	2	9/8/98	9/28/98	144	
Beryllium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.36	
Cadmium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	2.74	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	11700	
Chromium	EPA 3050B	6010B	2	0.7	2	9/8/98	9/28/98	48	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	10	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	93	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	34000	
Lead	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	215	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	7430	
Manganese	EPA 3050B	6010B	1	0.4	2	9/8/98	9/28/98	291	
Mercury	7471A	7471A	0.05	0.02	1	9/11/98	9/15/98	0.42	
Nickel	EPA 3050B	200 8	0.2	0.02	10	9/8/98	9/29/98	25.5	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	2460	
Selenium	EPA 3050B	200 8	1	0.3	10	9/8/98	9/29/98	8	
Silver	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	1.65	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	11800	
Thallium	EPA 3050B	200 8	0.02	0.006	10	9/8/98	9/29/98	0.15	
Tin	EPA 3050B	200 8	2	0.05	10	9/8/98	9/29/98	6	
Vanadium	EPA 3050B	6010B	2	0.6	2	9/8/98	9/28/98	66	
Zinc	EPA 3050B	6010B	2	0.8	2	9/8/98	9/28/98	297	

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05755ICP EM1 - Sample 10/1/98

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Date *10-1-98*

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354001	Units Basis	mg/Kg (ppm) Dry					
Lab Code	K9805755-002							
Test Notes								
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	18200
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND <i>WT</i>
Arsenic	EPA 3050B	200 8	0.5	0.1	10	9/8/98	9/29/98	16.3
Barium	EPA 3050B	6010B	1	0.6	2	9/8/98	9/28/98	141
Beryllium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.37
Cadmium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	2.72
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	8850
Chromium	EPA 3050B	6010B	2	0.7	2	9/8/98	9/28/98	50
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	92
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	33700
Lead	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	211
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	8060
Manganese	EPA 3050B	6010B	1	0.4	2	9/8/98	9/28/98	290
Mercury	7471A	7471A	0.05	0.02	1	9/11/98	9/15/98	0.46
Nickel	EPA 3050B	200 8	0.2	0.02	10	9/8/98	9/29/98	25.7
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	2430
Selenium	EPA 3050B	200 8	1	0.3	10	9/8/98	9/29/98	8
Silver	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	1.57
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	11700
Thallium	EPA 3050B	200 8	0.02	0.006	10	9/8/98	9/29/98	0.17
Tin	EPA 3050B	200 8	2	0.05	10	9/8/98	9/29/98	6
Vanadium	EPA 3050B	6010B	2	0.6	2	9/8/98	9/28/98	65
Zinc	EPA 3050B	6010B	2	0.8	2	9/8/98	9/28/98	300

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Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354002	Units	mg/Kg (ppm)						
Lab Code	K9805755-003	Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	21400	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	uJ
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	14 8	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	136	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 41	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	1 84	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	9270	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	42	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	10	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	82	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	32100	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	120	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	8740	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	286	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	1 12	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	25 3	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	2810	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	9	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	1 06	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	13100	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 17	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	6	
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	71	
Zinc	EPA 3050B -	6010B	2	0 8	2	9/8/98	9/28/98	242	

10/1/98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

<b>Sample Name</b>	98354003	<b>Units</b>	mg/Kg (ppm)
<b>Lab Code</b>	K9805755-004	<b>Basis</b>	Dry
<b>Test Notes</b>			

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	22200	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WJ
Arsenic	EPA 3050B	200 8	0.5	0.1	10	9/8/98	9/29/98	171	
Barium	EPA 3050B	6010B	1	0.6	2	9/8/98	9/28/98	100	
Beryllium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.43	
Cadmium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.66	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	6640	
Chromium	EPA 3050B	6010B	2	0.7	2	9/8/98	9/28/98	35	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	10	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	67	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	33700	
Lead	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	493	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9060	
Manganese	EPA 3050B	6010B	1	0.4	2	9/8/98	9/28/98	339	
Mercury	7471A	7471A	0.05	0.02	1	9/11/98	9/15/98	0.21	
Nickel	EPA 3050B	200 8	0.2	0.02	10	9/8/98	9/29/98	227	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	2940	
Selenium	EPA 3050B	200 8	1	0.3	10	9/8/98	9/29/98	10	
Silver	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	0.53	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	14600	
Thallium	EPA 3050B	200 8	0.02	0.006	10	9/8/98	9/29/98	0.15	
Tin	EPA 3050B	200 8	2	0.05	10	9/8/98	9/29/98	5	
Vanadium	EPA 3050B	6010B	2	0.6	2	9/8/98	9/28/98	91	
Zinc	EPA 3050B	6010B	2	0.8	2	9/8/98	9/28/98	148	

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Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

<b>Sample Name</b>	98354004	<b>Units</b>	mg/Kg (ppm)
<b>Lab Code</b>	K9805755-005	<b>Basis</b>	Dry
<b>Test Notes</b>			

Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	17700	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0.5	0.1	10	9/8/98	9/29/98	13.5	
Barium	EPA 3050B	6010B	1	0.6	2	9/8/98	9/28/98	81	
Beryllium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.36	
Cadmium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.56	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	5870	
Chromium	EPA 3050B	6010B	2	0.7	2	9/8/98	9/28/98	28	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	55	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	27300	
Lead	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	38.1	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	7480	
Manganese	EPA 3050B	6010B	1	0.4	2	9/8/98	9/28/98	281	
Mercury	7471A	7471A	0.05	0.02	1	9/11/98	9/15/98	0.17	
Nickel	EPA 3050B	200 8	0.2	0.02	10	9/8/98	9/29/98	19.0	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	2480	
Selenium	EPA 3050B	200 8	1	0.3	10	9/8/98	9/29/98	9	
Silver	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	0.47	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	11700	
Thallium	EPA 3050B	200 8	0.02	0.006	10	9/8/98	9/29/98	0.12	
Tin	EPA 3050B	200 8	2	0.05	10	9/8/98	9/29/98	4	
Vanadium	EPA 3050B	6010B	2	0.6	2	9/8/98	9/28/98	59	
Zinc	EPA 3050B	6010B	2	0.8	2	9/8/98	9/28/98	123	

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Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354005	Units Basis	mg/Kg (ppm) Dry						
Lab Code	K9805755-006								
Test Notes									
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	14800	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	10 9	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	58	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 33	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 49	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	11400	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	22	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	7	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	41	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	21400	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	29 8	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	6350	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	210	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	0 13	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	17 4	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	2100	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	7	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	0 34	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	9930	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 10	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	3	WT
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	51	
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98	92	

WT 12/99

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TS44mc/031695

03755ICP EM1 - Sample (6) 10/1/98

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Date 10-1-98

00011

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## COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwanush River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

## Total Metals

Sample Name	98354006	Units Basis	mg/Kg (ppm) Dry
Lab Code	K9805755-007		
Test Notes			
Analyte	Prep Method	Analysis Method	MRL MDL Dilution Factor Date Extracted Date Analyzed Result Notes
Aluminum	EPA 3050B	6010B	10 5 2 9/8/98 9/28/98 16900
Antimony	EPA 3050B	6010B	10 5 2 9/8/98 9/28/98 ND us
Arsenic	EPA 3050B	200 8	0 5 0 1 10 9/8/98 9/29/98 18 0
Barium	EPA 3050B	6010B	1 0 6 2 9/8/98 9/28/98 64
Beryllium	EPA 3050B	200 8	0 02 0 02 10 9/8/98 9/29/98 0 39
Cadmium	EPA 3050B	200 8	0 02 0 02 10 9/8/98 9/29/98 1 47
Calcium	EPA 3050B	6010B	10 3 2 9/8/98 9/28/98 5240
Chromium	EPA 3050B	6010B	2 0 7 2 9/8/98 9/28/98 40
Cobalt	EPA 3050B	6010B	2 2 2 9/8/98 9/28/98 8
Copper	EPA 3050B	6010B	2 2 2 9/8/98 9/28/98 45
Iron	EPA 3050B	6010B	4 4 2 9/8/98 9/28/98 24500
Lead	EPA 3050B	200 8	0 02 0 004 10 9/8/98 9/29/98 35 4
Magnesium	EPA 3050B	6010B	2 2 2 9/8/98 9/28/98 6800
Manganese	EPA 3050B	6010B	1 0 4 2 9/8/98 9/28/98 230
Mercury	7471A	7471A	0 05 0 02 1 9/11/98 9/15/98 0 24
Nickel	EPA 3050B	200 8	0 2 0 02 10 9/8/98 9/29/98 22 4
Potassium	EPA 3050B	6010B	400 400 2 9/8/98 9/28/98 2380
Selenium	EPA 3050B	200 8	1 0 3 10 9/8/98 9/29/98 8
Silver	EPA 3050B	200 8	0 02 0 004 10 9/8/98 9/29/98 0 81
Sodium	EPA 3050B	6010B	20 20 2 9/8/98 9/28/98 9680
Thallium	EPA 3050B	200 8	0 02 0 006 10 9/8/98 9/29/98 0 13
Tin	EPA 3050B	200 8	2 0 05 10 9/8/98 9/29/98 4
Vanadium	EPA 3050B	6010B	2 0 6 2 9/8/98 9/28/98 60
Zinc	EPA 3050B	6010B	2 0 8 2 9/8/98 9/28/98 120

MGT 1/2/98

Approved By

IS44Inc/031695  
05755ICP EM1 Sample (7) 10/1/98

JC

Date 10-1-98

00012

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## COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

## Total Metals

Sample Name	98354007							Units Basis	mg/Kg (ppm) Dry
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	24400	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	20 0	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	80	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 50	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 45	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	6630	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	32	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	11	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	59	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	36800	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	29 0	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9870	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	561	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	0 17	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	23 5	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	3210	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	10 5	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	0 35	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	15400	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 12	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	3	WT
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	76	
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98	122	

WT 1/2/99

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1844mc/031695

05755ICP EMI - Sample (8) 10/1/98

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Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354008	Units	mg/Kg (ppm)						
Lab Code	K9805755-009	Basis	Dry						
Test Notes									
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	23600	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	uJ
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	19 9	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	78	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 48	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 41	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	6490	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	32	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	10	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	58	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	35800	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	28 7	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9750	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	542	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	0 14	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	22 8	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	3170	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	11	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	0 37	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	15300	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 12	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	3	uJ
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	74	
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98	121	

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IS44mc/031695

05755ICP EM1 - Sample (9) 10/1/98

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Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354009	Units	mg/Kg (ppm)						
Lab Code	K9805755-010	Basis	Dry						
Test Notes									
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	23300	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	5	J
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	19 7	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	70	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 48	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 37	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	6380	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	31	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	10	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	55	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	34900	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	26 9	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9510	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	422	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	0 14	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	22 4	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	3130	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	11	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	0 31	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	15900	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 1	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	3	U.S.
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	74	
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98	114	

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IS44mc/011695

05755ICP EM1 Sample (10) 10/1/98

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Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354010	Units Basis	mg/Kg (ppm) Dry				
Lab Code	K9805755-011						
Test Notes							
Analyte	Prep Method	Analysis Method	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	22300
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	ND <i>WT</i>
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	20 8
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98 71
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98 0 48
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98 0 40
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98 6310
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98 30
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98 10
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98 55
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98 34200
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98 27 0
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98 9380
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98 476
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98 0 13
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98 21 8
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98 3050
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98 11
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98 0 40
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98 15900
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98 0 11
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98 3 <i>WT</i>
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98 71
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98 113

Approved By \_\_\_\_\_

1S44mc/031695

057551CP EM1 - Sample (11) 10/1/98

Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354011	Units	mg/Kg (ppm)						
Lab Code	K9805755-012	Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	21900	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	18 2	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	72	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 46	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 38	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	6390	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	29	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	10	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	54	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	33200	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	24 9	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9470	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	468	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	0 14	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	20 8	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	3040	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	11	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	0 36	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	15900	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 10	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	3	WT
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	68	
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98	111	

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Approved By

IS44mc031695

05755ICP EM1 - Sample (12) 10/1/98

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Date 10-1-98

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Page No

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354012	Units	mg/Kg (ppm)						
Lab Code	K9805755-013	Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	21900	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	UJ
Arsenic	EPA 3050B	200 8	0.5	0.1	10	9/8/98	9/29/98	19.2	
Barium	EPA 3050B	6010B	1	0.6	2	9/8/98	9/28/98	72	
Beryllium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.45	
Cadmium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.36	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	6520	
Chromium	EPA 3050B	6010B	2	0.7	2	9/8/98	9/28/98	29	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	53	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	33200	
Lead	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	24.7	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9250	
Manganese	EPA 3050B	6010B	1	0.4	2	9/8/98	9/28/98	388	
Mercury	7471A	7471A	0.05	0.02	1	9/11/98	9/15/98	0.13	
Nickel	EPA 3050B	200 8	0.2	0.02	10	9/8/98	9/29/98	20.9	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	2990	
Selenium	EPA 3050B	200 8	1	0.3	10	9/8/98	9/29/98	11	
Silver	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	0.27	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	15000	
Thallium	EPA 3050B	200 8	0.02	0.006	10	9/8/98	9/29/98	0.10	
Tin	EPA 3050B	200 8	2	0.05	10	9/8/98	9/29/98	3	UJ
Vanadium	EPA 3050B	6010B	2	0.6	2	9/8/98	9/28/98	68	
Zinc	EPA 3050B	6010B	2	0.8	2	9/8/98	9/28/98	109	

*WTW/12/98*

Approved By \_\_\_\_\_  
 IS44mc/031695  
 057551CP EM1 - Sample (13) 10/1/98

*JL*

Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354013	Units	mg/Kg (ppm)						
Lab Code	K9805755-014	Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	5810	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0.5	0.1	10	9/8/98	9/29/98	10.6	
Barium	EPA 3050B	6010B	1	0.6	2	9/8/98	9/28/98	13	
Beryllium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.12	
Cadmium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.13	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	3760	
Chromium	EPA 3050B	6010B	2	0.7	2	9/8/98	9/28/98	10	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	4	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	16	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	13400	
Lead	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	25.9	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	2830	
Manganese	EPA 3050B	6010B	1	0.4	2	9/8/98	9/28/98	135	
Mercury	7471A	7471A	0.05	0.02	1	9/11/98	9/15/98	0.02	J
Nickel	EPA 3050B	200 8	0.2	0.02	10	9/8/98	9/29/98	9.6	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	580	
Selenium	EPA 3050B	200 8	1	0.3	10	9/8/98	9/29/98	4	
Silver	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	0.22	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	3410	
Thallium	EPA 3050B	200 8	0.02	0.006	10	9/8/98	9/29/98	0.04	
Tin	EPA 3050B	200 8	2	0.05	10	9/8/98	9/29/98	46.8	
Vanadium	EPA 3050B	6010B	2	0.6	2	9/8/98	9/28/98	30	
Zinc	EPA 3050B	6010B	2	0.8	2	9/8/98	9/28/98	46	

WT/12/98

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 IS44mc/031695  
 05755ICP EM1 - Sample (14) 10/1/98

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Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354014	Units	mg/Kg (ppm)						
Lab Code	K9805755-015	Basis	Dry						
Test Notes									
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	25000	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0.5	0.1	10	9/8/98	9/29/98	12.6	
Barium	EPA 3050B	6010B	1	0.6	2	9/8/98	9/28/98	86	
Beryllium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.46	
Cadmium	EPA 3050B	200 8	0.02	0.02	10	9/8/98	9/29/98	0.42	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	9800	
Chromium	EPA 3050B	6010B	2	0.7	2	9/8/98	9/28/98	34	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	12	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	66	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	31400	
Lead	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	41.3	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	8900	
Manganese	EPA 3050B	6010B	1	0.4	2	9/8/98	9/28/98	323	
Mercury	7471A	7471A	0.05	0.02	1	9/11/98	9/15/98	0.18	
Nickel	EPA 3050B	200 8	0.2	0.02	10	9/8/98	9/29/98	27.1	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	3150	
Selenium	EPA 3050B	200 8	1	0.3	10	9/8/98	9/29/98	10	
Silver	EPA 3050B	200 8	0.02	0.004	10	9/8/98	9/29/98	0.36	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	11800	
Thallium	EPA 3050B	200 8	0.02	0.006	10	9/8/98	9/29/98	0.12	
Tin	EPA 3050B	200 8	2	0.05	10	9/8/98	9/29/98	4	
Vanadium	EPA 3050B	6010B	2	0.6	2	9/8/98	9/28/98	70	
Zinc	EPA 3050B	6010B	2	0.8	2	9/8/98	9/28/98	115	

WT/12/98

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IS44mc/031695

05755ICP EM1 Sample (15) 10/1/98

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Date

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment      **Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354015	Units Basis	mg/Kg (ppm) Dry						
Lab Code	K9805755-016								
Test Notes									
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	25000	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	15 1	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	95	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 46	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 55	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	7440	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	35	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	12	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	83	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	34000	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	47 3	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9440	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	379	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	0 25	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	25 9	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	3250	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	11	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	0 44	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	13000	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 12	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	5	
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	72	
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98	137	

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Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

Sample Name	98354016	Units	mg/Kg (ppm)						
Lab Code	K9805755-017	Basis	Dry						
Test Notes									
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	27100	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	14 1	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	103	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 47	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 46	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	7490	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	38	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	13	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	82	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	35800	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	44 9	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	9820	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	374	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	0 24	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	27 4	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	3490	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	11	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	0 40	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	13200	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 12	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	5	
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	78	
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98	139	

WT 11/2/98

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 IS44mc/031695

05755ICP EM1 Sample (17) 10/1/98

Date 10-1-98

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**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

**Total Metals**

<b>Sample Name</b>	98354017	<b>Units</b>	mg/Kg (ppm)
<b>Lab Code</b>	K9805755-018	<b>Basis</b>	Dry
<b>Test Notes</b>			

<b>Analyte</b>	<b>Prep Method</b>	<b>Analysis Method</b>	<b>MRL</b>	<b>MDL</b>	<b>Dilution Factor</b>	<b>Date Extracted</b>	<b>Date Analyzed</b>	<b>Result</b>	<b>Result Notes</b>
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	22100	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	15 7	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	138	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 38	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 51	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	7120	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	36	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	11	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	89	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	30700	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	65 2	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	8440	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	323	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	0 32	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	23 5	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	2900	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	10	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	0 45	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	11800	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 12	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	6	
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	67	
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98	151	

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IS44mc/031695

05755ICP EM1 - Sample (18) 10/1/98

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Date *10-1-98*

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## COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

## Total Metals

Sample Name	98354018	Units	mg/Kg (ppm)						
Lab Code	K9805755-019	Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	22700	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	13 8	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	72	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 41	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 32	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	6480	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	28	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	10	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	44	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	31000	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	18 6	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	8630	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	329	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	0 12	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	20 0	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	2970	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	10	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	0 21	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	16800	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 08	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	2	WT
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	69	
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98	99	

WT/12/98

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 1S44mc031695  
 05755ICP EM1 - Sample (19) 10/1/98

Date 10-1-98

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## COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

**Client:** Roy F Weston, Inc  
**Project:** Duwamish River/4000-027-001-2019-38  
**Sample Matrix:** Sediment

**Service Request:** K9805755  
**Date Collected:** 8/24/98  
**Date Received:** 8/25/98

## Total Metals

Sample Name	98354019	Units	mg/Kg (ppm)						
Lab Code	K9805755-020	Basis	Dry						
Analyte	Prep Method	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aluminum	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	24000	
Antimony	EPA 3050B	6010B	10	5	2	9/8/98	9/28/98	ND	WT
Arsenic	EPA 3050B	200 8	0 5	0 1	10	9/8/98	9/29/98	12 3	
Barium	EPA 3050B	6010B	1	0 6	2	9/8/98	9/28/98	76	
Beryllium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 43	
Cadmium	EPA 3050B	200 8	0 02	0 02	10	9/8/98	9/29/98	0 40	
Calcium	EPA 3050B	6010B	10	3	2	9/8/98	9/28/98	6840	
Chromium	EPA 3050B	6010B	2	0 7	2	9/8/98	9/28/98	28	
Cobalt	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	11	
Copper	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	47	
Iron	EPA 3050B	6010B	4	4	2	9/8/98	9/28/98	31300	
Lead	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	20 3	
Magnesium	EPA 3050B	6010B	2	2	2	9/8/98	9/28/98	8740	
Manganese	EPA 3050B	6010B	1	0 4	2	9/8/98	9/28/98	334	
Mercury	7471A	7471A	0 05	0 02	1	9/11/98	9/15/98	0 11	
Nickel	EPA 3050B	200 8	0 2	0 02	10	9/8/98	9/29/98	20 1	
Potassium	EPA 3050B	6010B	400	400	2	9/8/98	9/28/98	3010	
Selenium	EPA 3050B	200 8	1	0 3	10	9/8/98	9/29/98	11	
Silver	EPA 3050B	200 8	0 02	0 004	10	9/8/98	9/29/98	0 22	
Sodium	EPA 3050B	6010B	20	20	2	9/8/98	9/28/98	16000	
Thallium	EPA 3050B	200 8	0 02	0 006	10	9/8/98	9/29/98	0 10	
Tin	EPA 3050B	200 8	2	0 05	10	9/8/98	9/29/98	2	WT
Vanadium	EPA 3050B	6010B	2	0 6	2	9/8/98	9/28/98	70	
Zinc	EPA 3050B	6010B	2	0 8	2	9/8/98	9/28/98	105	

WT 1/2/99

Approved By \_\_\_\_\_ *JL* Date 10-1-98  
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